ABSTRACT

A reciprocating electromagnetic pump comprising a coil wound about a bipolar or tripolar core, a diaphragm structure mechanically coupled to at least one arm with a magnet attached to one end of the arm and a controller electronically connected to the coil. The controller comprises a pulse generator, a solid state switch that interrupts current flow through the pump electromagnet and additional electronic circuitry for signal processing. The arm is vibrated under the influence of a periodic electromagnetic field to produce the flow of gas. The flow of current through the electromagnet is interrupted so that the magnets are impelled during either a vacuum or a pressure stroke, but are not impelled during the reciprocal stroke. A signal produced in the electromagnet coil during the reciprocal is processed to provide feedback to control the pump drive frequency and phase to match the pump mechanical self-resonant frequency and phase under varying pumping loads. The signal can also be processed to provide a display of the pumping load and/or to provide feedback for control of the flow of gas.